



BIKE PARK FEASIBILITY STUDY

ARLINGTON, MA

Prepared for the Town of Arlington Parks & Recreation Commission

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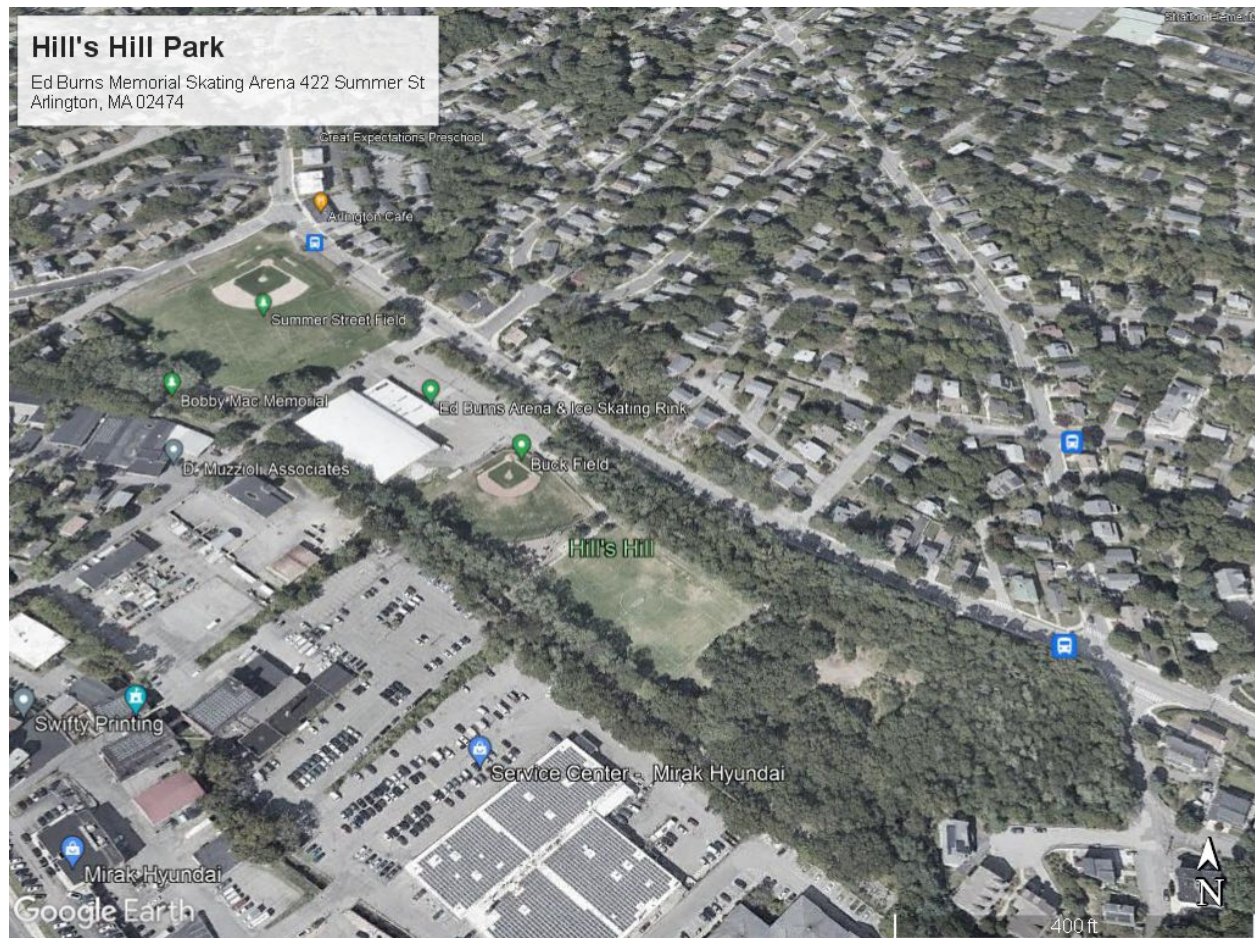
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Site Background

Arlington, MA grew by nearly 4,000 people in a decade to a **population of 46,300** in 2020 (U.S. Census). Site in consideration as recommended by client is the Hill's Hill Park at the Ed Burns Arena & Ice-Skating Rink. In addition to the rink, Hill's Hill is host to several baseball/ soccer fields, Parks & Recreation offices and a woodlands area with walking trails throughout. The park is bordered on the southwestern edge by the **Minuteman Rail Trail**, a double track multi-use thoroughfare for walkers, runners, and bicyclists that stretched east-west through town from Arlington's Great Meadows to Thorndike field. With a population density of **8325.7 per square mile**, the land is thickly settled. Hill's Hill park, centrally located within Arlington and adjoining a main recreational thoroughfare, is **likely one of the most accessible locations to foot & bike traffic** within the city limits. The undeveloped wooded spaces of the park have been subject to littering, vandalism, and unsanctioned trail building activities in recent years.

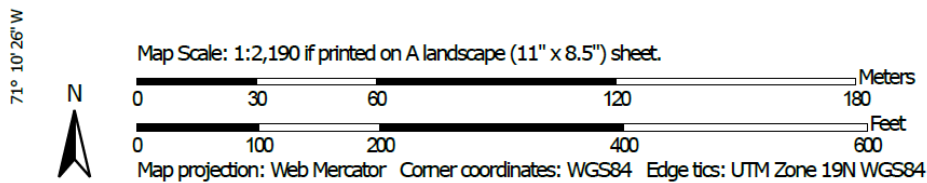
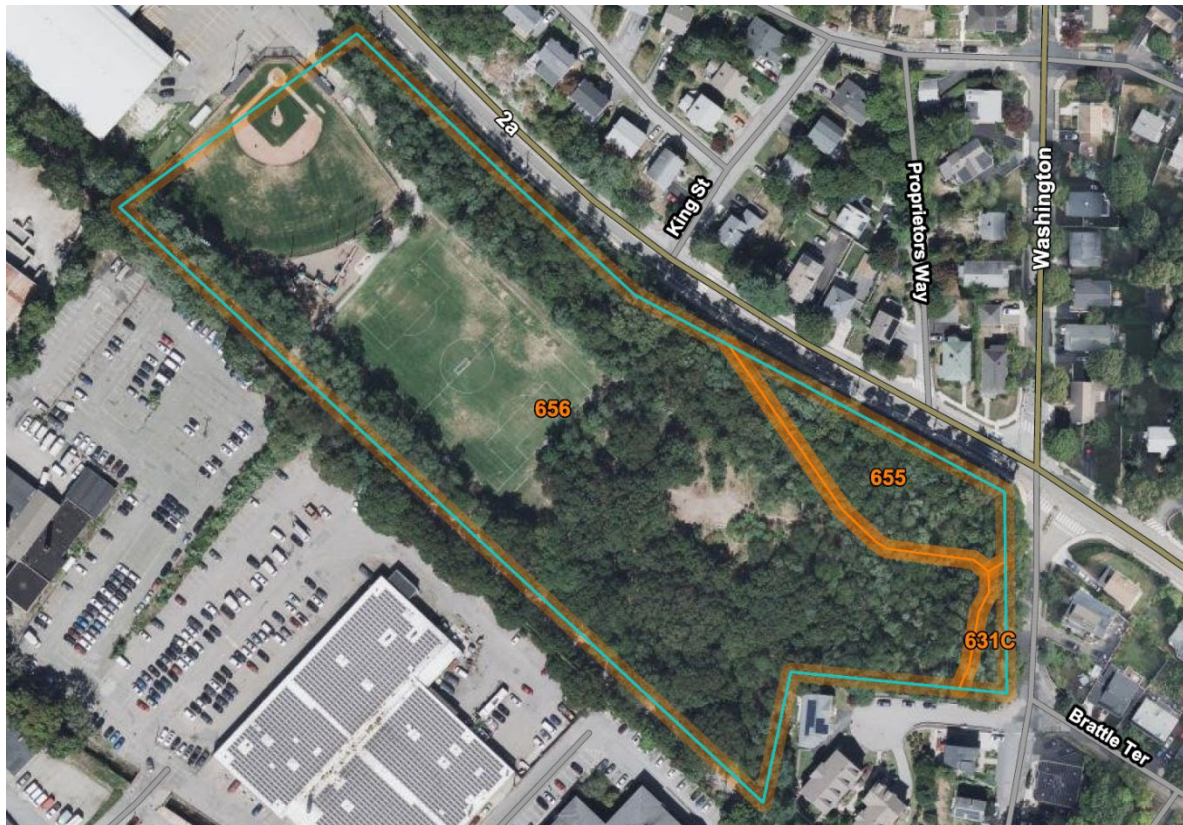


Site Analysis

Total Park Size: 14.5 Acres

Usable for MTB: 3.1 Acres – 21% (highlighted below)

NRCS Soil Survey Data



**Natural Resources
Conservation Service**

Web Soil Survey
National Cooperative Soil Survey

Map Unit Setting

- Elevation: 0 to 3,000 feet
- Mean annual precipitation: 32 to 54 inches
- Mean annual air temperature: 43 to 54 degrees F
- Frost-free period: 110 to 240 days
- Farmland classification: Not prime farmland

Map Unit Composition

Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
631C	Charlton-Urban land-Hollis complex, 3 to 15 percent slopes, rocky	0.1	1.4%
655	Udorthents, wet substratum	0.6	8.2%
656	Udorthents-Urban land complex	6.9	90.4%
Totals for Area of Interest		7.6	100.0%

A. 656—Udorthents-Urban land complex

Area: 6.9 Acres
Percentage of AOI : 90.4%

Parent material (Udorthents): Loamy alluvium and/or sandy glaciofluvial deposits and/or loamy glaciolacustrine deposits and/or loamy marine deposits and/or loamy basal till and/or loamy lodgment till

Setting

- Landform position (two-dimensional): Footslope
- Landform position (three-dimensional): Base slope
- Down-slope shape: Linear
- Across-slope shape: Linear
- Parent material: Excavated and filled land

Properties and Qualities:

- Slope: 0 to 15 percent
- Depth to restrictive feature: More than 80 inches
- Depth to water table: More than 80 inches
- Frequency of flooding: None
- Frequency of ponding: None

B. 655—Udorthents, wet substratum

- Udorthents, wet substratum, and similar soils: 85 percent
- Minor components: 15 percent
- Similar Properties & Qualities to 656

Area: 0.6 Acres
Percentage of AOI: 8.2%

Parent material: Loamy alluvium and/or sandy glaciofluvial deposits and/or loamy glaciolacustrine deposits and/or loamy marine deposits and/or loamy basal till and/or loamy lodgment till

C. 631C—Charlton-Urban land-Hollis complex, 3 to 15 percent slopes, rocky

Area: 0.1 Acres
Percentage of AOI: 1.4%

Typical profile:

- H1 - 0 to 5 inches: fine sandy loam
- H2 - 5 to 22 inches: sandy loam
- H3 - 22 to 65 inches: gravelly sandy loam

Conclusions from Soil Survey:

- While localized sections of hard rock or ledge have been visually observed on-site, the overall classification of the soil (particularly the large depth to restrictive features) indicates relative ease of digging conditions. It is recommended that core samples or test holes be dug during the design process to determine exact local soil composition.
- No sensitive areas, wetlands, or highly unfavorable classifications of soil exist within the scope of the areas in question. The small portion of Wet Substratum may require more protection from pooling and erosion by increasing drainage capacity
- Low to average annual rainfall and a moderately weak frost season mean decreased maintenance, less erosion, and increased tread stability.

Environmental

Categories of consideration:

- **Wetland conservation**
 - There are no delineated wetland boundaries within or proximal to the project scope. Any seasonal/temporary pools or streams will be observed and, if necessary, avoided until drained or bridged and realigned.
- **Stormwater runoff and erosion control**
 - Mill Brook flows W-E about 200 yards south of the minuteman rail trail.

- This distance exceeds the baseline riparian buffer (50 ft) size surrounding any permanent or semi-permanent stream, brook, or waterway.
 - Urban landscaping and development exists between the park and any permanent or semi-permanent stream or brook, further reducing the risk of a detrimental stormwater discharge to any waters of the city.
 - Standard erosion control measures should be taken in order to minimize general soil loss and movement.
- **Wildlife impact and habitation**
 - Typical wildlife considerations would include locating and preserving den sites (Fox, Bear, Coyote, etc.), presence of endangered species, predator sighting, or aviary habitat (elevated hawk & owl nests)
 - There are no official records or common sightings of endangered species, seasonal breeding grounds, or pristine environments within the scope of the project.
 - Wildlife habitation is fluid, and it is recommended to the contractor to be aware of how to spot dens, nests, or endangered species in order to prevent any future debilitation.
 - **Observation of endangered or invasive species of Plantae**
 - There are no publicly recorded endangered species of plant life within the project boundary.
 - There are invasive observed in the park currently, such as Garlic Mustard (*Alliaria petiolate*) and Oriental Bittersweet (*Celastrus Orbiculatus*). These plants are on the watch list presented by the Arlington Land Stewards. Any of these species that are encountered or proximate to the work site will be removed and disposed via methods recommended by the Stewards.

Community Input

On September 23, 2021, the Arlington Parks & Recreation Commission held a public input session to gauge the level of community support for mountain bike facilities within the town of Arlington. Established need within the community through public input sessions. During the course of the meeting, over a dozen individuals/families voiced their support and concerns for the project. While there were some questions about the potential impact of the park on the environment and current ecology of Hill's Hill, comments made during this meeting were overwhelmingly positive and in support of installing mountain bike infrastructure. Many individuals who spoke during the meeting recognized the positive impact that mountain biking has had on them as individuals and families, as well as the impact that similar facilities have already made in other communities across New England. Many residents also expressed a desire

to remediate the illegal activity in the park through positive means, and that the proposed bike park may accomplish that goal as well.

The most often mentioned comments:

1. Requests for progression-based features that would cater to all skill levels
2. Remediation of the current illegal trail building and vandalism happening in the wooded sections of the park.
3. Removal of invasive species and preservation of the current flora & fauna of the park
4. Community involvement during the design and build process. Multiple residents expressed the desire to volunteer when appropriate.

Design Concepts



Screenshot from Powder Horn LLC's design of the Keene Bike Park in Keene, NH

Municipal Bike parks typically contain the following Zones:

Pump Track (All Skill Levels)

Skills Training (Beginner/Intermediate)

Freeride (Intermediate/Expert)

These zones together meet the interests of large portions of modern riders, on many different types of bicycle. It is critical to offer zones for riders of ALL skill levels, from Beginner through Expert. While the main focus of this park is to offer riders a fun place to practice their skills, there is an ever-growing number of expert riders in New England and around the globe that are interested in advanced-level riding.

Pump Track

A pump track is a closed loop circuit installed on a level surface, containing features such as rollers, banked corners, table-tops, and start/rest areas. This type of zone is designed for short-travel bikes such as BMX, hardtail MTB, and slopestyle. The intention is for the rider to 'pump' the rollers and corners to gain speed and carry momentum without pedaling. This creates an exhilarating, yet non-intimidating experience that delivers an incredible cardio workout, advances



motor skills and reaction time in all ages, and develops fundamentals essential skills for all styles of riding.

Toddler Area/Beginner Pump Track Characteristics:

- 12-18" Rollers
- 30-degree continuous banked corners
- Simplified oval design with minimal variation
- Separated from larger pump track to ensure comfortable environment for young children and first-time riders



Beginner pump Track under construction in Keene, NH

Intermediate/Expert Pump Track Characteristics:

- 16-24" Rollers
- 45 Degree and steeper banked corners containing rollers
- Variations, doubles, tabletops, and wall rides
- Designed to allow intermediate riders to challenge their skills and improve cornering, jumping, and pumping skills

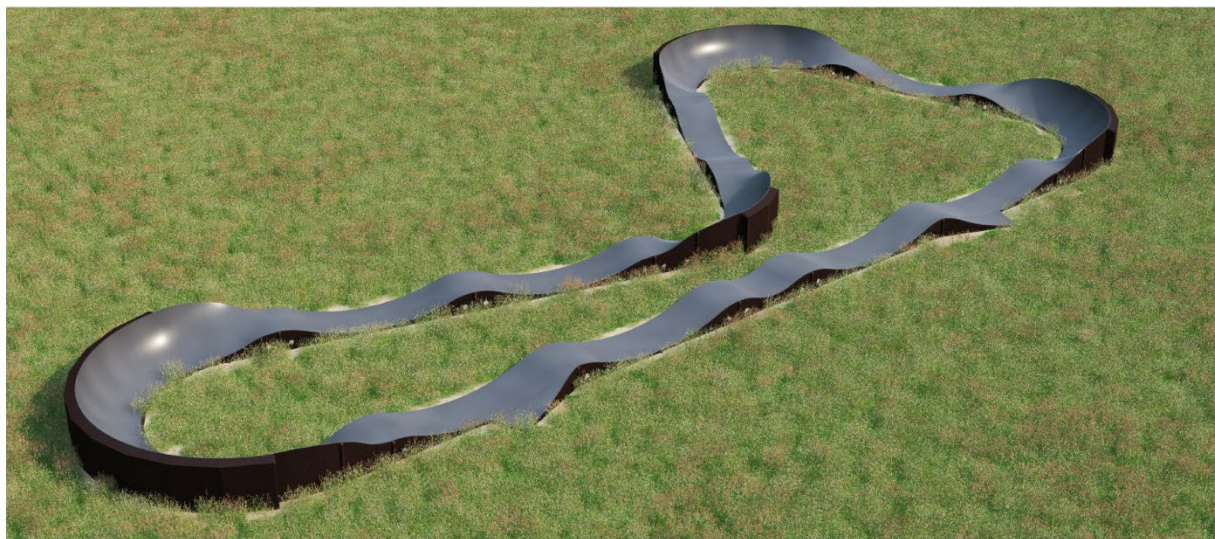
Pump Tracks can be constructed with several different material types. The (3) main surface types are:

- Natural earthen surface (dirt, clay, topsoil)
- Prefabricated (concrete or composite surface)
- Asphalt

See 'Surface Types' on page 18 for details

The World Cup

Item	Track Length	Height	Width	Length	Lumberjack	Mason
The World Cup	217'	3.0'	40.0'	89.0'	*\$51,891.29	n/a



Sample Composite Surface, Prefabricated pump track

Skills Training Zone

Skills Trainer zones are designed for beginners who look to learn the fundamentals of riding varied terrain features. The features in this zone are designed to imitate those that the rider will find on the trail, in the pump track, or at other bike parks; the intent is to familiarize beginner riders with all different surface types and shapes. Rollers, rock gardens, wooden bridges, drops, table-tops, and banked corners are all included in this type of zone.

Nessy

Item	Height	Length	Width 18"	Width 24"	Width 30"	Width 36"
Nessy 2 Bumps (2'P, 1'V)	2'	31.7'	\$3,393.47	\$3,817.66	*\$4,241.84	\$4,666.02
Nessy 3 Bumps (2'P, 1'V)	2'	44.7'	\$4,963.10	\$5,583.49	\$6,203.88	\$6,824.27
Nessy 4 Bumps (2'P, 1'V)	2'	57.7'	\$6,532.74	\$7,349.33	\$8,165.92	\$8,982.51



Split Decision

Item	Height	Length	Width 18"	Width 24"	Width 30"	Width 36"
Split Decision	2'	48.8'	\$5,885.63	\$6,621.34	*\$7,357.04	\$8,092.74

(Left layout shown. Orders need to specify left or right layout.)



Straight Ladder

Item	Height	Length	Width 8"	Width 12"
Straight Ladder (3.5 Deg)	1'	27.7'	\$1,892.38	\$2,102.64
Straight Ladder (15 Deg)	1'	15.4'	\$1,315.01	\$1,461.12
Straight Ladder (11 Deg)	2'	27.7'	\$1,918.58	\$2,131.76
Straight Ladder (15 Deg)	2'	22.9'	\$1,747.87	*\$1,942.08



Features sourced from Progressive Bike
Ramps© LLC

Freeride Zone



Freeride, Flow, or Jump Zones are often the main attraction of a bike park, where many intermediate and advanced riders will seek to hone their skills on advanced features such as jumps, table-tops, gaps, drops, hips, wall-rides, and bridges. In most cases these types of zones are what generate popular content and draw riders from far away. Well-built flow zones are often recognized world-wide, and there are examples of these that have garnered extraordinary exposure through the social media & YouTube channels of professional and well-known riders. While there is increased amplitude in advanced riding features, the associated skill level of the participating riders means no real increase in risk.



SWOT Analysis

Strengths

- Need / want established within the community
- Solves vacant lot abuse
- Burnishes existing resource
- Proximity to Rail Trail

Weaknesses

- Relatively small space for trails
- Ledge Rock present in proposed pump track area

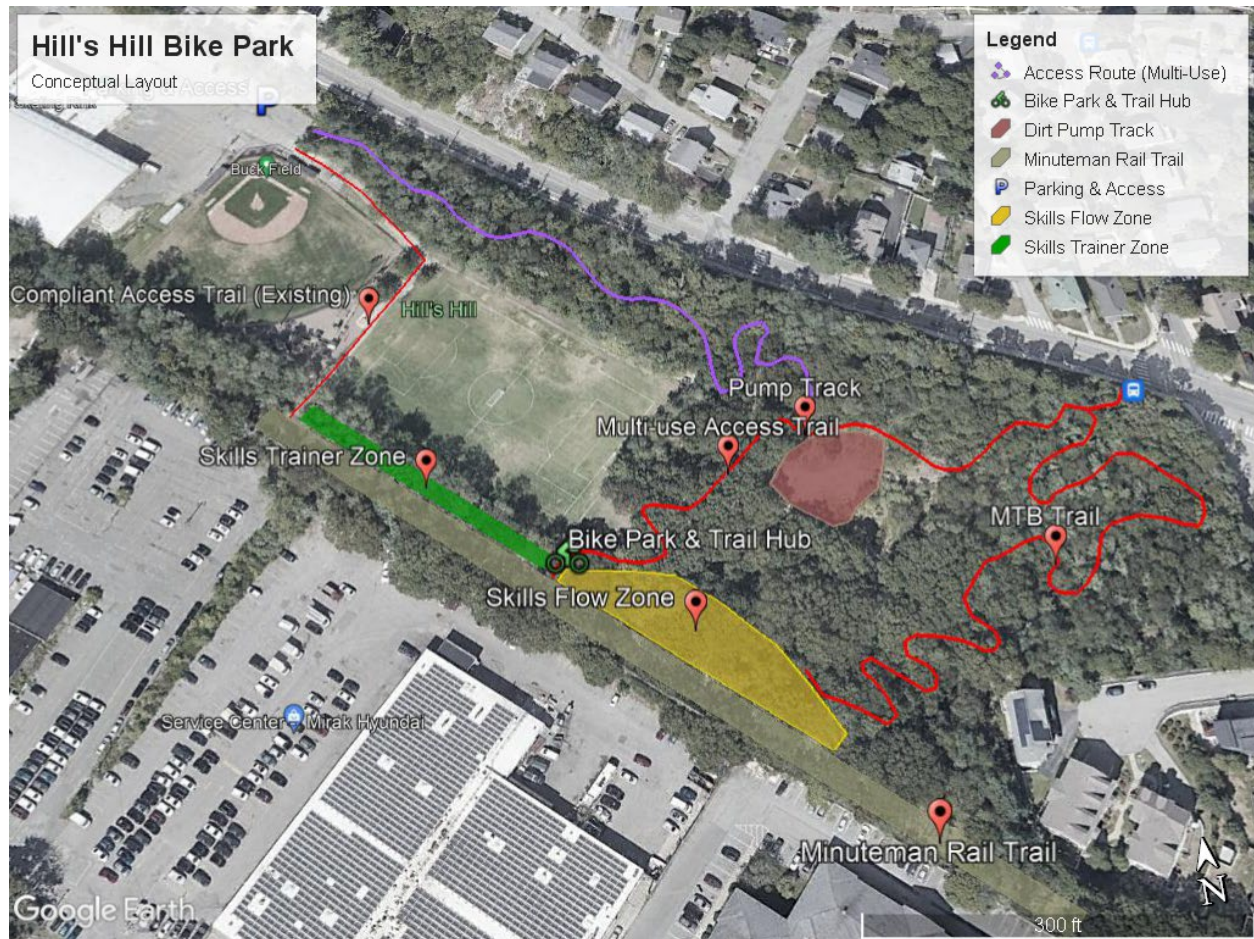
Opportunities

- Provide enhanced community resource
- Capitalize on growing MTB participation
- Raise awareness of other park features and increase usage

Threats

- Neglected maintenance or lack of upkeep leading to degradation and abandonment
- Increasingly volatile weather patterns (I.e., heavy rainstorms) and related erosion
- Potentially high volume leading to heavy wear

Based on the site survey & analysis, the following is a concept layout that would include different zones catering to all different types, skill levels, and ages of riders.



1. Access Routes

- ADA Compliant route must be included to give access from parking areas to the entrance of the facility (Bike Park & Trail Hub)
- Secondary route (Purple) gives non-ADA multi-use access from Hockey Rink to Pump Track to alleviate traffic congestion

2. Pump Track

- If ample material is available or additional cost of imported material is acceptable, a dirt surface is feasible.
- Hard or composite surface is recommended for durability and added accessibility

3. Beginner Skills Zone

- Proximity to Rail Trail and parking areas means ease of access for families and young children who need supervision
4. Freeride Zone
 - Makes use of existing ‘dead zone’ parallel to rail trail
 - Caters to intermediate and advanced users, while increasing overall safety by staying separate from beginner facilities
 5. Hub Areas
 - Bike Park & Trail Hub
 - Located at the intersection of the Minuteman Rail Trail, Skills Zone, and Freeride Zone
 - Rules & Etiquette sign located here, along with maps and directional signage to inform & guide users to each zone
 - Serves as the main access point to reduce cross-traffic and unwanted merges
 - Parking/ Access Hubs
 - At both the Skating Rink lot and the bus drop-off/crosswalk on Summer St., directional and informative signage that points users towards the trail hub and access points

Signage

1. Access Points:
 - Rules & Etiquette
 - Informational maps & directional signs
 - MTB only vs. Multi-use vs. Hike only explanation
2. On- Trail:
 - Trail/zone difficulty level
 - Intended user (MTB vs. Hike-only)
 - Caution & Warning (merge, exit, etc.)
 - Adventure/ Discovery
 - i.e., Trail Names, rare species, nature information



Sample Designs

Powder Horn LLC ©



Exhibit A: Sample Construction Plan & Surface Types

A. Site Clearing & Preparation

First, the area is outlined and enclosed per OSHA regulations with signage, fencing (if necessary) and gates to ensure a safe and secure job site.

Vegetation and surface organics are removed from the work area. Timber is either staged to mill or chipped and stacked for later use. Turf, surface organics, and loam are staged to be used in the landscaping process or exported for disposal.

B. Design Layout

Once the work area is prepared and compacted to the foundation level, the track dimensions and utility/drainage additions are located and marked. Any necessary erosion control measures are installed (silt fence, matting, hay booms, etc.).

C. Drainage, Utilities, & Sub-base

Material Staging & Sorting Imported aggregate is staged and moved as close as possible to the work area. If possible, any imported material is unloaded directly into the work area to minimize shuttling time. Aggregate generated on-site is processed as needed and staged as close as possible to final location.

D.

With the area surveyed and marked, excavation begins on the drainage system. Silt collection areas and pipes are installed with the necessary material, and all systems are measured to ensure proper slope and outflow distribution of storm water. Conduit, foundations, and bases of permanent structures are also excavated and installed (i.e. concrete bases for lights, footings for support structure, etc.). All riding areas are checked to ensure ground material stability, and if necessary are modified to meet structural requirements.

E. Base Shaping

First layer of track material is moved into position, compacted, and shaped in preparation for the surface material. Different types of riding surface will require different types of base material (see Asphalt Construction)

F. Surface Application

The high-quality surface material is deposited onto the pre shaped base. This material will be the final layer and the surface that is ridden on. This material can be either screened dirt, or asphalt depending on the design choice. This material is precision-shaped by a combination of machines and hand laborers, then compacted to a smooth and consistent finish.

G. Landscaping & Finishing

All non-riding areas are backfilled to specification in the design. Grade on the non-riding surface is brought up to match the grade of the riding surface to eliminate any sudden drops or inconsistencies that may cause difficulties if a rider mistakenly goes off-track. These non-riding areas are revegetated with grass or turf to eliminate erosion and create a sharp, detailed look

Surface Types

Dirt / Aggregate

As implied, this method uses the native or imported material that has been screened clean of stone and other unwanted particles to create a homogeneous mix. Typically, mineral soil or a high clay content is desired to help sustain the final shape of the track. While easy to change and repair, dirt surfaces have the highest levels of required maintenance and typically need an annual overhaul. Untreated dirt is also the option with the lowest cost.

Treated Earth

This method uses the same material as option #1, but is treated with an organic, non-toxic solution to harden and increase the durability of the surface material. There are several different brands of solution that are made specifically for this purpose; “DirtGlue” brand solution was used in our construction of the Keene pump track with positive results.

Asphalt

Asphalt surfaces are the costliest, yet most sustainable option. Asphalt requires little to no maintenance for years after the original construction if applied properly. This surface type has been popularized in recent years by several global construction companies (i.e. Velosolutions). Using asphalt is highly recommended for its low maintenance levels, traction while riding, and clean finished look.

Prefabricated

Prefabricated pump tracks can be made of precast concrete, or timber-framed with a hard composite molded surface. These options, while somewhat restrictive in design flexibility, provide a fantastic balance between maintenance / lifespan and cost. While less expensive than an asphalt hard surface track that allows full design customization with a hard surface, prefabricated pump tracks are leaps and bounds more durable than earthen surfaces and require very little maintenance. Ease of installation is also a plus.

Exhibit B: Asphalt Pump Track Build Process

1. Demolition/ Site Clearing

- a. Cut, process, and export/stack any or all harvestable timber
- b. Remove all organic material and surface layer to expose foundation material
- c. Installation of perimeter erosion control materials (silt fence, matting, hay bales, etc.)

2. Grading & Sloping of Base

Accurate sloping and compaction of base material is critical to ensure the stability of the base material. Stability of the base directly relates to the longevity of the final surface and its ability to withstand years of storm water, freeze/thaw cycles, and rider traffic.

- a. Grade foundation material to ensure proper shed of runoff to drain inlets or other settling points
- b. Mapping & layout of drains, inlets, exits, and silt control areas
- c. Locating, mapping, and layout of any pre-installed or planned utilities (i.e. water, power)

3. Preparing the sub-base

Proper sub-base installation is crucial for the durability and quality of the finished asphalt surface. Compaction of this material is key, as it provides the foundation and support for the asphalt laid directly on top. Sub-base material is a specific product ranging from ¾” to 1.5” minus, which contains finer particles that act as a binding agent.

- a. Purchase, load in and stage aggregate material
- b. Transfer material to track layout
- c. Spread, grade, and compact material with heavy equipment
- d. Proof-roll subbase to ensure even and total compaction
- e. Ride subbase to quality check shape and flow of track

4. Asphalt Application

Once the sub-base is laid and any soft areas are identified and repaired, it is time to add the binder.

- a. The binder layer is large aggregate mixed with oil, making it extraordinarily strong and durable.
- b. Surface layer is applied on top of the binder layer. Surface asphalt is made up of small aggregate, sand, and oil. This combination of materials creates jet-black asphalt that, when installed appropriately, provides a smooth ride and a shiny, attractive finished surface.

5. Final Shape & Compaction

- a. As the asphalt is applied via bucket loader, it is continually shaped by hand to match the grade of the sub-base. A team of experienced shapers with rakes and shovels fine-tunes the contour.
- b. Small plate compactors and rollers are used to finalize the shape and stabilize the asphalt after application. Propane torches and hand tools are used to smooth out any imperfections left by the plate compactor.

6. Backfill, Finish Grade, and Revegetation

- a. After the entire asphalt riding surface and drainage system has been installed, aggregate and organic material are imported to create a clean, finished look.
- b. Rip rap (4-6") and clean stone (3/4") is added surrounding drainage inlets or sumps and supporting wet banks
- c. Clean fill and topsoil are used to match and blend with the finish grade of the asphalt
- d. Grass is sown on all sections of exposed topsoil within and surrounding the track. Any landscaping included in the design is installed (trees, shrubs, gardens, mulch, etc.)

